GENERIC SCAN TOOL

ON BOARD DIAGNOSTIC (OBD), GENERAL INFORMATION

Characteristics of On Board Diagnostic (OBD)

The Engine Control Module (Motronic Engine Control Module -J220-) is equipped with DTC memory.

If malfunctions occur at the emissions relevant systems or components, they are stored in DTC memory with a description of the malfunction type.

The Engine Control Module (ECM) differentiates between different DTCs after evaluating the information. See **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:** .

The stored malfunctions can be checked with a standard diagnostic tester. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again. See **READINESS CODE, GENERATING** .

The following work steps must be performed in the described sequence after the malfunction(s) have been repaired:

1. - Check DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
2. - Erase DTC memory. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
3. - For completion, generate readiness code. See **READINESS CODE, GENERATING** .

On Board Diagnostic (OBD), technical data

Control module identification

The control module version is displayed by selecting "Diagnostic mode 9: Vehicle information" under address word 33. See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION** .

Engine Control Module (ECM) equipment

ON BOARD DIAGNOSTIC TECHNICAL DATA

Engine Code	AEG	AVH	AZG	BDC
System identification	Motronic M5.9.2	Motronic ME7.5	Motronic ME7.5	Motronic ME7.5

Terminals at Engine Control Module (ECM)	80	121	121	121
Emissions limiting values according to	LEV(1)	ULEV (2)	LEV(1)	ULEV(2)
On Board Diagnostic (OBD)	OBD II	OBD II	OBD II	OBD II
DTC memory(3)	Permanent	Permanent	Permanent	Permanent
Memory for adaptation values (4)	Temporary	Temporary	Temporary	Temporary
Oxygen sensor control	2 sensors	2 sensors	2 sensors	2 sensors
Knock sensor control	2 knock sensors	2 knock sensors	2 knock sensors	2 knock sensors
Intake manifold change-over	No	No	No	Yes
Camshaft adjustment	No	No	No	No
Boost pressure regulation	No	No	No	No
Secondary Air Injection (AIR) system	Yes	Yes	Yes	Yes
Electronic engine load regulation system	No	Yes	Yes	Yes

(1) 1) LEV = Low Emission Vehicles (emission values max. 0.075 g/mi HC).

(2) 2) ULEV = Ultra Low Emission Vehicles (emission values max. 0.040 g/mi HC).

(3) 3) Independent of voltage supply.

(4) 4) Values are erased when voltage supply is interrupted.

Selectable diagnostic modes under address word 33 - OBD

NOTE: The conditions required for selecting the desired diagnostic mode are listed in the following table:

SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD

Diagnostic mode			**Requirement:**		
Selectable diagnostic modes under address word 33 - OBD			• engine off • Ignition switched on.	• Engine running at idle	• Vehicle in drive mode
Mode 1:	Check measured values	See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES**	Yes	Yes	Yes
Mode 2:	Checking operating	See **DIAGNOSTIC MODE 2: CHECKING**	Yes	Yes	Yes

	conditions	**OPERATING CONDITIONS**			
Mode 3:	Check DTC Memory	See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY**	Yes(1)	Yes	Yes
Mode 4:	Reset/erase diagnostic data	See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA**	Yes	Yes	Yes
Mode 5:	Check output of oxygen sensor signals	See **DIAGNOSTIC MODE 5: CHECK OUTPUT OF OXYGEN SENSOR SIGNALS**	Yes	Yes	Yes
Mode 6:	Check test results of components that are not continuously monitored	See **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**	No	Yes	Yes
Mode 7:	Check test results of components that are continuously monitored	See **DIAGNOSTIC MODE 7: CHECK TEST RESULTS OF COMPONENTS THAT ARE CONTINUOUSLY MONITORED**	Yes(1)	Yes	Yes
Mode 8:	Tank leak test	See **DIAGNOSTIC MODE 8: TANK LEAK TEST**	No	Yes	No
Mode 9:	Vehicle information	See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION**	Yes	Yes	Yes
(1) Perform only with ignition switched on when engine does not start (operate starter beforehand for at least 6 seconds).					

Connect diagnostic tester

Recommended special tools and equipment

- VAS 5052 Vehicle Diagnostic and Information System with

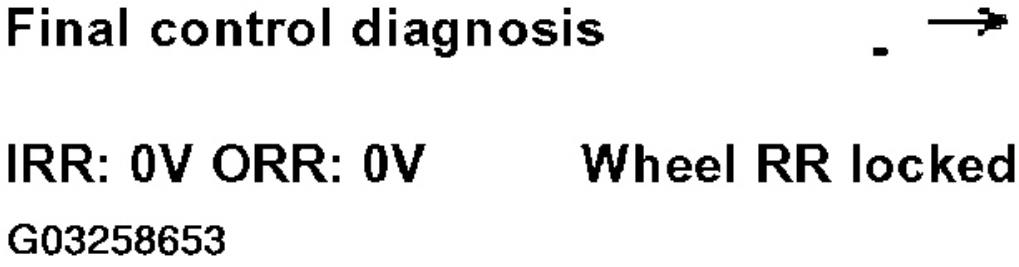

Fig. 1: Identifying VAS 5052 Vehicle Diagnostic And Information System (Connect Diagnostic Tester)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VAS 5052/3 diagnostic cable

Requirements

- The respective fuses of the Motronic fuel injection and ignition system must be OK.

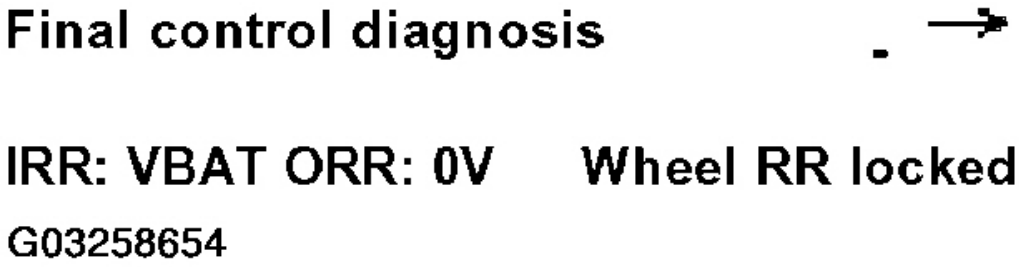

Fig. 2: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Fuse holder is located behind access panel at far left end of dash.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.

- For vehicles with automatic transmission, selector lever must be in position -P- or -N-.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Ignition switched off.

Work procedure

Connect diagnostic tester (VAS 5052) using (VAS 5052/3) diagnostic cable as follows:

- Connect diagnostic cable connector to Data Link Connector (DLC) -arrow-.

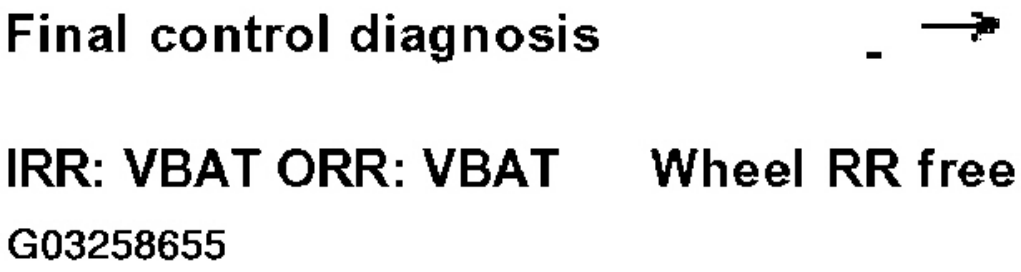

Fig. 3: Locating Data Link Connector
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Depending on the desired diagnostic mode, it is necessary to either switch on ignition or start engine. See **Selectable diagnostic modes under address word 33 - OBD** .

NOTE:

- **Respective operation of the diagnostic tester:**

- If no display appears on diagnostic tester, check voltage supply.

Test box for wiring test, connecting

Recommended special tools and equipment e.g.:

Vehicles with 80-pin Engine Control Module (ECM, engine code AEG)

- VAG1598/22 test box

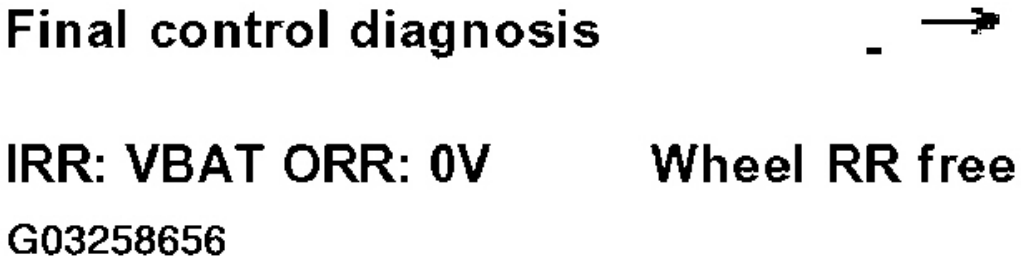

Fig. 4: Identifying VAG1598/22 Test Box (80-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with 121-pin Engine Control Module (ECM, engine code AVH, AZG, BDC)

- VAG1598/31 test box

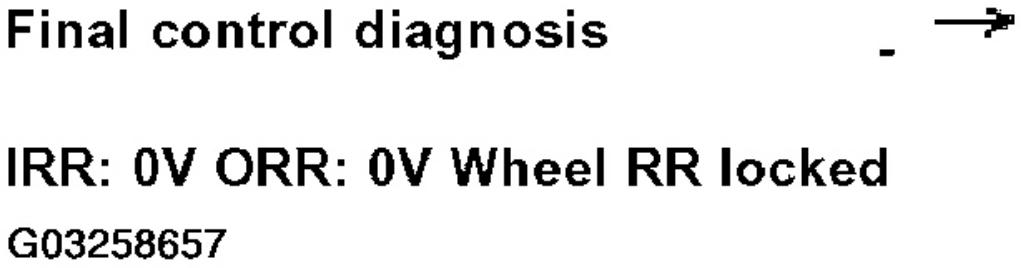

Fig. 5: Identifying VAG1598/31 Test Box (121-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Requirement

- Ignition switched off.

Work procedure

- Remove inner cover, left plenum chamber, to do this, slide center cover -1- of plenum chamber forward out of catch and remove from instrument panel.

Fig. 6: Removing Inner Cover, Left Plenum Chamber By Sliding Center Cover Of Plenum Chamber Forward
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove three bolts -1-.

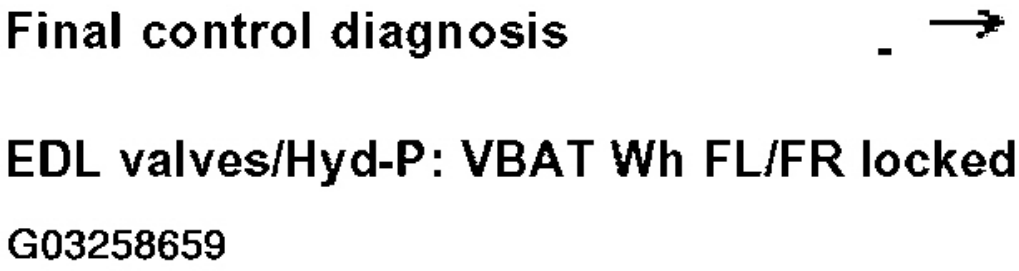

Fig. 7: Removing Three Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lift left cover -1- of plenum chamber in center of instrument panel (arrow A) and thereby unclip (front edge clips, back edge clamps).

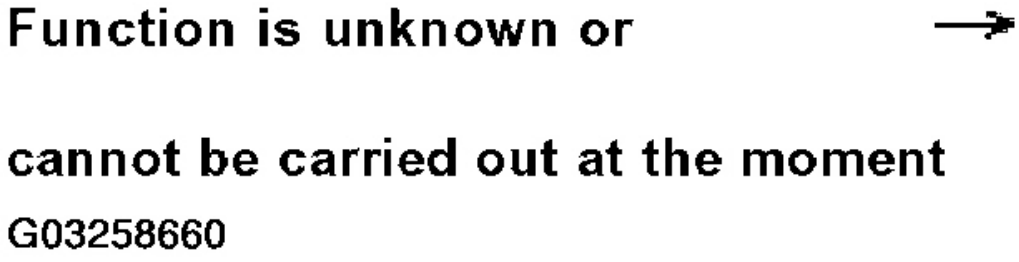

Fig. 8: Lifting Left Cover Of Plenum Chamber In Center Of Instrument Panel And Unclip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull cover -1- toward vehicle center out of bracket underneath A-pillar (arrow B).
- Then disengage connector from control module and disconnect.

Vehicles with 80-pin Engine Control Module (ECM, engine code AEG)

- Connect VAG1598/22 test box at control module wiring harness.

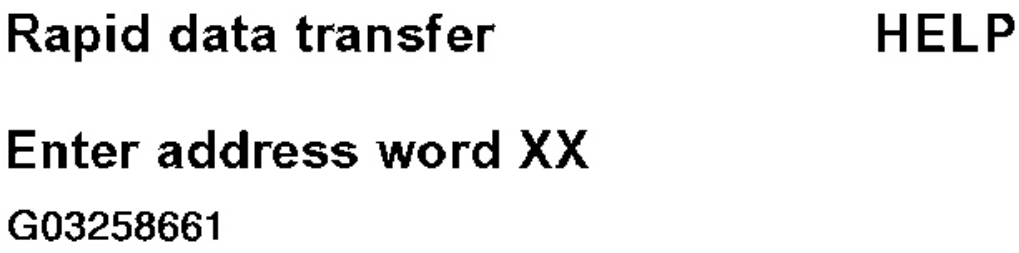

Fig. 9: Connecting VAG1598/22 Test Box At Control Module Wiring Harness (80-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with 121-pin Engine Control Module (ECM, engine code AVH, AZG, BDC)

- Connect VAG1598/31 test box at control module wiring harness. Engine Control Module (ECM) is not connected.

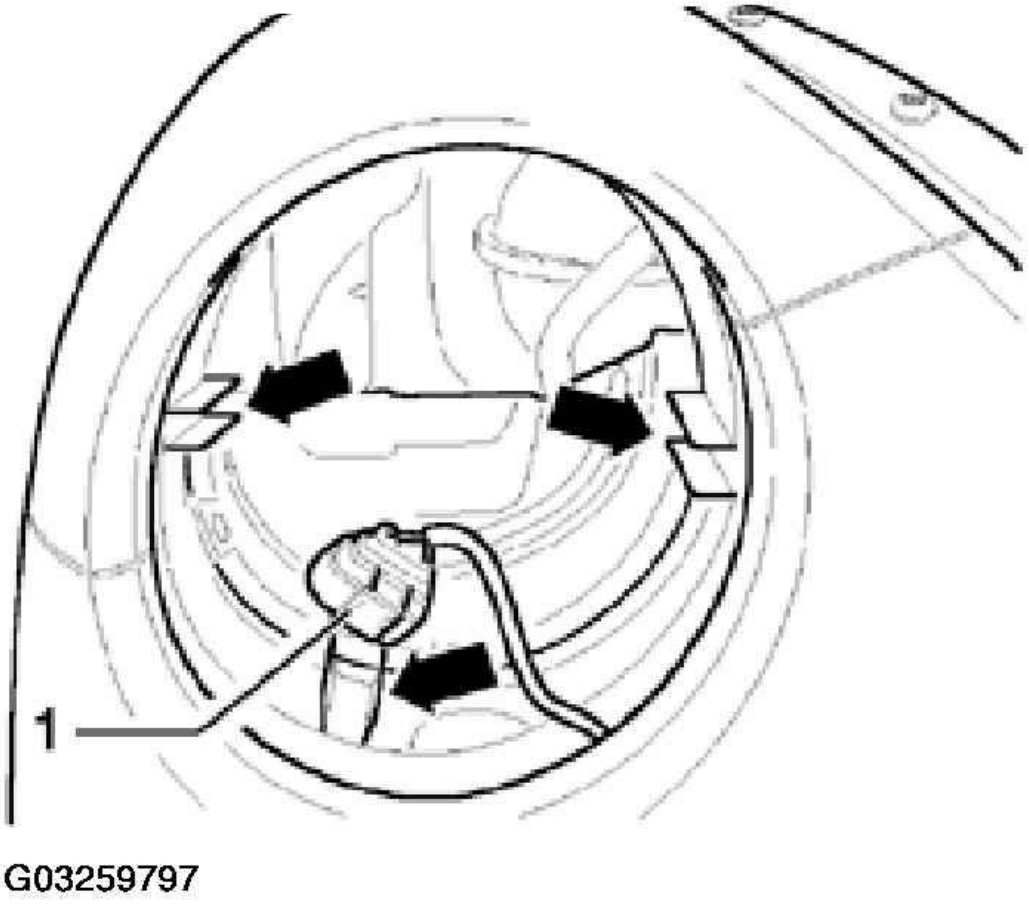

Fig. 10: Connecting VAG1598/31 Test Box At Control Module Wiring Harness (121-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again. See **READINESS CODE, GENERATING** .

Malfunction Indicator Lamp (MIL) in instrument cluster, checking

Meaning of emissions MIL

The Malfunction Indicator Lamp (MIL) lights up when emissions relevant malfunctions are recognized by the Engine Control Module (ECM).

Component location of emissions MIL

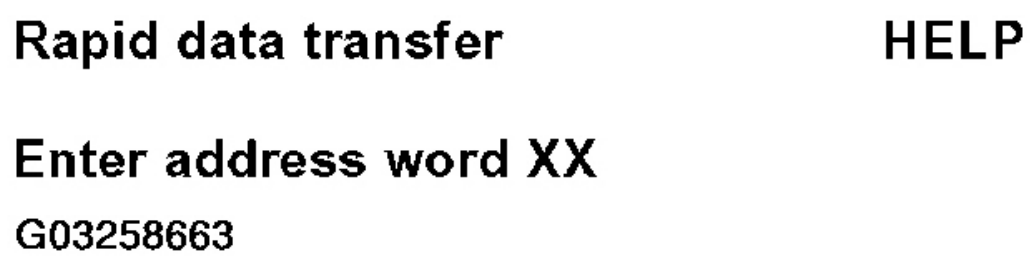

Fig. 11: Identifying Component Location Of Emissions MIL
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The Malfunction Indicator Lamp (MIL) can blink or remain lit continuously. DTC memory must be checked in each case. See DIAGNOSTIC MODE 3: CHECK DTC MEMORY .

- Blinking: There is a malfunction that causes damage to the catalytic converter in this driving condition. In this case, vehicle must only be driven at reduced performance!
- Continuously lit: There is a malfunction that causes increased emissions. Check DTC memory for Motronic control module.
- DTC memory must still be checked if there are driveability problems or customer complaints and the MIL is not lit, since malfunctions can be stored without causing the MIL to light immediately.

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirement

- The respective fuses of instrument cluster must be OK.

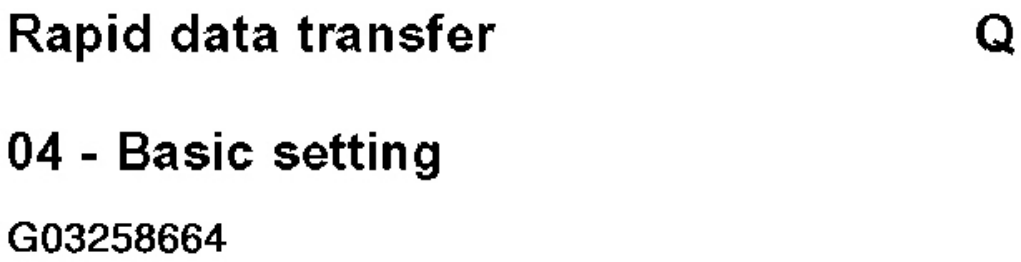

Fig. 12: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Fuse holder is located behind access panel at far left end of dash.

Test sequence

- Switch on ignition: The emissions MIL must light up.

If emissions MIL does not light up when ignition is switched on:

- Switch ignition off.
- Check wire from ECM to emissions MIL as follows:
- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .

Vehicles with engine code AEG

- Bridge sockets 2 + 17 of test box with the respective adapter cables.

Vehicles with engine code AVH, AZG and BDC

- Bridge sockets 2 + 47 of test box with the respective adapter cables.

Continuation for all vehicles

- Switch on ignition: Emissions MIL must light up.

If Malfunction Indicator Lamp (MIL) does not light up:

- Switch ignition off.
- Remove instrument cluster;

See **INSTRUMENT CLUSTER** .

- Check wire connection from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL) -K83- according to wiring diagram:

See appropriate System Wiring Diagram article.

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

If emissions MIL lights up when ignition is switched on:

- Start engine and let run at idle: Emissions MIL must go out after a few seconds.

If Malfunction Indicator Lamp (MIL) does not go out:

- Switch ignition off.
- Remove instrument cluster:

See **INSTRUMENT CLUSTER** .

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .

Vehicles with engine code AEG

- Check wire connection between test box socket 17 and instrument cluster for short circuit to Ground (GND) according to wiring diagram:

See appropriate System Wiring Diagram article.

Vehicles with engine code AVH, AZG and BDC

- Check wire connection between test box socket 47 and instrument cluster for short circuit to Ground (GND) according to wiring diagram:

See appropriate System Wiring Diagram article.

Continuation for all vehicles

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

DIAGNOSTIC MODE, SELECTING

Recommended special tools and equipment

- VAS 5052 Vehicle Diagnostic and Information System with

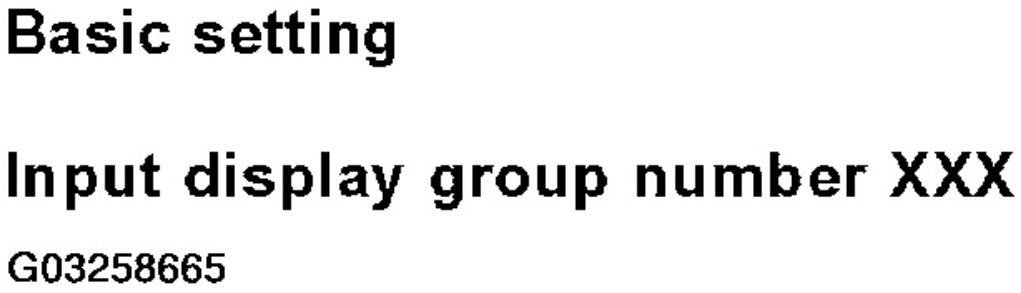

Fig. 13: Identifying VAS 5052 Vehicle Diagnostic And Information System (Selecting Diagnostic Mode)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VAS 5052/3 diagnostic cable

Address word 33 - On-Board Diagnostic (OBD)

Function

Via the diagnostic tester, different diagnostic modes can be selected under "address word 33 - On-Board Diagnostic (OBD)".

The following diagnostic modes monitor all components and systems which influence the emission quality.

Diagnostic mode 1: Check measured values

Requirement

- Coolant temperature must be at least 80° C, PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition, switch on ignition or start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- Select the desired measured values "PID XX".

NOTE:

- **The specified values for the respective measuring values can be found at the respective component- and function tests.**
- **The following list only serves as an overview.**
- **The measuring values are sorted according to the PID (parameter-identifications).**

PID DISPLAY MEASURING VALUES (DIAGNOSTIC MODE 1)

PID	Display measuring values
01:	Monitoring status since erasing DTC memory
02:	DTC • Only for vehicles with engine code AEG
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Valve timing adjustment at 1. cyl. to "advance"
15:	Intake Air Temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)
18:	Availability status of secondary air
21:	Bank 1 - sensor 2
28:	OBD requirement for which this vehicle is designed

Vehicles with engine code AEG

If DTCs are displayed in "PID 02":

- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2xxx-DTCs** .

Continuation for all vehicles

- End diagnosis and switch ignition off.

Diagnostic mode 2: Checking operating conditions

Function

This diagnostic mode displays the operating conditions at which an emission relevant malfunction was detected and stored by the Engine Control Module (ECM).

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition: switch on ignition or start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 2: Check operating conditions."
- Select the desired operating condition "PID XX".

NOTE: The operating conditions are sorted by the PID (parameter-identifications).

PID AND DISPLAY OPERATING CONDITIONS (DIAGNOSTIC MODE 2)

PID	Display operating conditions
02:	DTC which triggered the current reception of all control module information • Only for vehicles with engine code AEG
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed

Vehicles with engine code AEG

If DTCs are displayed in "PID 02":

- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2XXX-DTCS** .

Continuation for all vehicles

- End diagnosis and switch ignition off.

Diagnostic mode 3: Check DTC Memory

Function

This diagnostic mode indicates all stored DTCs of components and systems which are emission relevant.

Malfunction Indicator Lamp (MIL) in instrument cluster lights up for one DTC entry.

SAE Diagnostic Trouble Codes (DTCs)

The DTC always consists of a 5-digit alphanumeric value with the following meaning:

Component group:

- Pxxxx = DTC for drivetrain

Norm-Code:

- P0xxx = DTCs defined by SAE with specified malfunction texts
- P1xxx = additional emission relevant DTCs provided by manufacturer
- P2xxx = DTCs defined by SAE with specified texts, from MY 2000
- P3xxx = additional emissions relevant DTCs provided by manufacturer from MY 2000

System group:

- Px0xx = Fuel and air ratio and additional emission regulations
- Px1xx = Fuel and air ratio
- Px2xx = Fuel and air ratio
- Px3xx = Ignition system
- Px4xx = additional emission regulation
- Px5xx = Speed and idle control
- Px6xx = Control module and output signals
- Px7xx = Transmission
- Px8xx = Transmission
- Px9xx = Control modules, input and output signals

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- Operate starter for approx. 6 seconds. Do not switch ignition off afterward.
- Under address word 33, select "Diagnostic mode 3:, Check DTC memory."

The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.
- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .

- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2xxx-DTCs** .
- SAE P3xxx-DTCs. See **SAE P3xxx-DTCs** .

NOTE:

- **The DTC table is sorted by SAE code.**
- **"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.**
- **"Emission"-relevant malfunctions are additionally indicated in the instrument cluster via the Malfunction Indicator Lamp (MIL).**
- **In Diagnostic mode 2, it can be determined at which operating condition a malfunction was detected and stored by the Engine Control Module (ECM). See DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS .**
- **Erase DTC memory after repairing malfunction. See DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Display example:

P0444 Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- Open circuit

Explanation:

- P0444 = SAE diagnostic trouble code (malfunction identification number)
- Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- malfunctioning wiring path or malfunctioning component
- Open circuit = Malfunction type as text

Diagnostic mode 4: Reset/erase diagnostic data

Function

This diagnostic mode performs the following functions:

- all emission relevant malfunctions in DTC memory will be erased,
- the operating conditions at which a malfunction was stored will be reset. See **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS** .
- all adaptation values are being reset,
- all test results of the diagnostic functions are being reset.

Requirement

- DTC memory was checked. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 4: Reset/erase diagnostic data."

Erased or reset:

- Number and content of the DTC memories,
- Operating conditions,
- Adaptation values,
- Test results.

- End diagnosis and switch ignition off.
- Generate readiness code. See **READINESS CODE, GENERATING** .

Diagnostic mode 5: Check output of oxygen sensor signals

Function

The static values of the oxygen sensors are indicated via this diagnostic mode.

The values of the individual oxygen sensor signal outputs must reach the specified value or must be within the min.- and max.-limits.

Requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

- Coolant temperature must be at least 80 °C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 5: Check output of oxygen sensor signals".
- Select the desired output of oxygen sensor signals "Test-ID XX"

EVALUATION OF OUTPUT OF OXYGEN SENSOR SIGNALS (DIAGNOSTIC MODE 5)

Test-ID:	Evaluation of output of oxygen sensor signals	Vehicles with engine code	
		AEG	AVH, AZG, BDC
01	Bank 1 sensor 2: rich to lean sensor barrier voltage	-	See **Evaluation test-ID 09: Time period between sensor shift procedures (Vehicles with engine code AEG)**
02	Bank 1 sensor 2: lean to rich sensor barrier voltage	-	See **Evaluation test-ID 02 Bank 1 Sensor 2: lean to rich sensor barrier voltage (Vehicles with engine code AVH, AZG, BDC)**
07	Minimum voltage at sensor for test cycle	See **Evaluation test-ID 07: Minimum voltage at sensor for test cycle (Vehicles with engine code AEG)**	See **Evaluation test-ID 07 Bank 1 Sensor 2: Minimum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)**
08	Maximum voltage at sensor for test cycle	See **Evaluation test-ID 08: Maximum voltage at sensor for test cycle (Vehicles with engine code AEG)**	See **Evaluation test-ID 08 Bank 1 Sensor 2: Maximum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)**
09	Time period between sensor shift procedures	See **Evaluation test-ID 09: Time period between sensor shift procedures (Vehicles with engine code AEG)**	-
129	Bank 1 sensor 1: Actual value of oxygen sensor voltage	-	See **Evaluation test-ID 129 Bank 1 Sensor 1: Actual value of oxygen sensor voltage (Vehicles with engine code AVH, AZG, BDC)**
130	Bank 1 sensor 1: Control barrier voltage	-	See **Evaluation test-ID 130 Bank 1 Sensor 1: Control barrier voltage (Vehicles with engine code AVH, AZG, BDC)**
131	Bank 1 sensor 1: Dynamic	-	See **Evaluation test-ID 131 Bank 1**

	value		**Sensor 1: Dynamic value (Vehicles with engine code AVH, AZG, BDC)**
132	Bank 1 sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2)	-	See **Evaluation test-ID 132 Bank 1 Sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2) (Vehicles with engine code AVH, AZG, BDC)**

- End diagnosis and switch ignition off.

Evaluation test-ID 07: Minimum voltage at sensor for test cycle (Vehicles with engine code AEG)

EVALUATION TEST-ID 07: MINIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (ENGINE CODE AEG)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	1	80
Bank 1 sensor 2	1	80

If the specified value is not reached:

- Short circuit to Ground (GND) in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:

- Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

- Short circuit to B+ or open circuit in wiring in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

Evaluation test-ID 08: Maximum voltage at sensor for test cycle (Vehicles with engine code AEG)

EVALUATION TEST-ID 08: MAXIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (ENGINE AEG)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	100	190
Bank 1 sensor 2	100	190

If the specified value is not reached:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:
- Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Short circuit to Ground (GND) or open circuit in wiring in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Short circuit to B+ in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

Evaluation test-ID 09: Time period between sensor shift procedures (Vehicles with engine code AEG)

EVALUATION TEST-ID 09: TIME PERIOD BETWEEN SENSOR SHIFT PROCEDURES (ENGINE AEG)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0	250

If the specified value is exceeded:

- Oxygen sensor faulty:

- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

Evaluation test-ID 01 Bank 1 Sensor 2: rich to lean sensor barrier voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 01 BANK 1 SENSOR 2: RICH TO LEAN SENSOR BARRIER VOLTAGE (AVH, AZG, BDC)

Oxygen sensor	**Specified value:**
Bank 1 sensor 2	Fixed value: 0.600 V

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) 2 Bank 1 Behind Three Way Catalytic Converter (TWC) -G130-. See item 11 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 02 Bank 1 Sensor 2: lean to rich sensor barrier voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 02 BANK 1 SENSOR 2: LEAN TO RICH SENSOR BARRIER VOLTAGE (AVH, AZG, BDC)

Oxygen sensor	**Specified value:**
Bank 1 sensor 2	Fixed value: 0.600 V

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) 2 Bank 1 Behind Three Way Catalytic Converter (TWC) -G130-. See item 11 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 07 Bank 1 Sensor 2: Minimum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 07 BANK 1 SENSOR 2: MINIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 2	0,000	0,501

If the specified value is exceeded:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:

- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

- Short circuit to B+ or open circuit in wiring in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 08 Bank 1 Sensor 2: Maximum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 08 BANK 1 SENSOR 2: MAXIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 2	0,699	1,048

If the specified value is not reached:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:

- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

- Short circuit to Ground (GND) or open circuit in wiring in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Short circuit to B+ in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 129 Bank 1 Sensor 1: Actual value of oxygen sensor voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 129 BANK 1 SENSOR 1: ACTUAL VALUE OF OXYGEN SENSOR VOLTAGE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0,648	1,992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 130 Bank 1 Sensor 1: Control barrier voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 130 BANK 1 SENSOR 1: CONTROL BARRIER VOLTAGE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0,648	1,992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 131 Bank 1 Sensor 1: Dynamic value (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 131 BANK 1 SENSOR 1: DYNAMIC VALUE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0,1	3,0

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 132 Bank 1 Sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2) (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 132 BANK 1 SENSOR 1: OXYGEN SENSOR SHIFT VIA OXYGEN SENSOR CONTROL (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	-0,03	0,03

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Diagnostic mode 6: Check test results of components that are not continuously monitored

Function

This diagnostic mode displays the test results of emission relevant components and systems which are not continuously monitored.

The values of the individual test results must reach the specified value or must be within the min.- and max.-limits.

DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS NOT CONTINUOUSLY MONITORED

Test-ID	Component, System	Test
01:	Catalytic converter	See **TEST-ID 01: CATALYTIC CONVERTER**
03:	Secondary Air Injection (AIR) system	See **Test-ID 03: Secondary Air Injection (AIR) system**
05:	Tank ventilation system	See **Test-ID 05: Tank ventilation system**

Test-ID 01: Catalytic converter

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 01: Catalytic converter".
- Check specified values at idle.

EVALUATION TEST-ID 01: CATALYTIC CONVERTER

	AEG		AVH, AZG, BDC	
	Specified value:		Specified value:	
Vehicles with engine code	min.	max.	min.	max.
Catalytic converter monitoring bank 1, aging value				

• Up to model year 1999	-	2.00	-	-
• Up to model year 2000	-	0.35	-	-
• From model year 2001	-	-	0.90	-
• From model year 2003	-	-	0.90	-
Catalytic converter monitoring bank 1, aging value, short test				
• Up to model year 1999	-	2.00	-	-
• Up to model year 2000	-	0.44	-	-
• From model year 2001	-	-	0.80	-
• From model year 2003	-	-	0.80	-

- End diagnosis and switch ignition off.

If specified values are not obtained:

- Replace the front exhaust pipe with catalytic converter:

- Vehicles with engine code AEG. See item 13 in **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** .
- Vehicles with engine code AVH, AZG, BDC. See item 10 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .

Continuation for all vehicles

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 03: Secondary Air Injection (AIR) system

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".

- Select the "Test-ID 03: Secondary Air Injection (AIR) system"
- Check specified values at idle.

EVALUATION TEST-ID 03: SECONDARY AIR INJECTION (AIR) SYSTEM

Vehicles with engine code	AEG		AVH		AZG, BDC	
	Specified value:		Specified value:		Specified value:	
	min.	max.	min.	max.	min.	max.
reduced secondary air mass bank 1	32.00	-	0.20	-	0.35	-
very small secondary air mass bank 1, short test	-	-	0.00	-	0.60	-

- End diagnosis and switch ignition off.

If the specified values are not reached:

- Check secondary air system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Secondary Air Injection (AIR) Pump Motor -V101-. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** .
- Check combination valve. See **COMBINATION VALVE, CHECKING** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Check Secondary Air Injection (AIR) Pump Motor -V101-. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 05: Tank ventilation system

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110 °C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .

- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 05: Tank ventilation system".
- Check specified values at idle.

EVALUATION TEST-ID 05: TANK VENTILATION SYSTEM (1 Of 2)

Vehicles with engine code	AEG		AVH, AZG, BDC	
	Specified value:		Specified value:	
Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-	**min.**	**max.**	**min.**	**max.**
Passive test (can only check OK)	-	-	0,1484	-
Active test: Deviation of oxygen sensor control in direction "lean" (can only check OK), short test	-	246,000	0,070	-
Active test: Deviation of oxygen sensor control in direction "rich" (can only check OK), short test	10,000	-	-0,070	-
Active test: Air balance at idle OK, also short test	-	-	32,900	-
Active test: Air balance at idle not OK, also short test	-	-	32,900	-

EVALUATION TEST-ID 05: TANK VENTILATION SYSTEM (2 Of 2)

Vehicles with engine code	AEG		AVH, AZG Up to model year 2002		AVH, AZG, BDC From model year 2002	
	Specified value:		Specified value:		Specified value:	
Tank seal	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**
Large/small leak	-	-	1,90..0,95	-	1,90	-
Reed contact not closed	-	-	-	1,00	-	0,5
Reed contact does not open	-	-	-	25,00	-	30,00
Tank ventilation system not OK during initial flush	-	-	-	-	0	-
Pinhole leak	-	-	1,90..0,00	-	5,8	-

If the specified values are exceeded:

- EVAP canister system, checking for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR**

PROPER SEAL .

- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak Detection Pump (LDP) -V144-, checking. See **CHECK LEAK DETECTION PUMP (LDP)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 09: Engine Coolant Temperature (ECT) Sensor -G62- (Vehicles with engine code AVH, AZG, BDC)

Test requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test until a coolant temperature of 80 to 100° C has been reached. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Observe the safety precautions that apply to road tests. See **SAFETY PRECAUTIONS** .

- Switch ignition off.
- Start engine at a coolant temperature of 80 to 90° C and let it run at idle.
- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 09: Engine Coolant Temperature (ECT) sensor".
- Check specified values at idle.

EVALUATION TEST-ID 09: ECT SENSOR

	Specified value:	
Engine Coolant Temperature (ECT) Sensor -G62-	**min.**	**max.**
• Coolant temperature	80° C	115° C

- End diagnosis and switch ignition off.

If specified value is not obtained:

- Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** .
- Check thermostat: See applicable repair manual.

Diagnostic mode 7: Check test results of components that are continuously monitored

Function

This diagnostic mode indicates all stored DTCs of components and systems which are continuously monitored.

Requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- Operate starter for approx. 6 seconds. Do not switch ignition off afterward.
- Under address word 33, select "Diagnostic mode 7: Check test results of components that are continuously monitored".

The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.
- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2XXX-DTCS** .
- SAE P3xxx-DTCs. See **SAE P3XXX-DTCS** .

NOTE:

- **The DTC table is sorted by SAE codes.**
- **"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.**

- **Erase DTC memory after repairing malfunction. See DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Diagnostic mode 8: Tank leak test

Function

This diagnostic mode checks the fuel system for leaks.

NOTE:

- **The Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- and Leak Detection Pump (LDP) -V144- seal the tank system.**
- **Pressure (max. 70 mbar) can be applied to the fuel system via the test connection (in engine compartment, right) and via engine leak detection spray (e.g.: G 001 800 A1) leaks can be detected.**

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .
- Intake air temperature must not be above the maximum of 60° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Function test

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle for at least 15 minutes.
- Under address word 33, select "Diagnostic mode 8: Tank leak test".
- Select measuring value "Test -ID 01: Tank leak test".
- Check specified value of tank leak test at idle.

EVALUATION TEST-ID 01: TANK LEAK TEST

Tank leak test	Specified value:
• Test function is being initiated, please wait • Test function aborted • Test function active • Test function off	Test function active

NOTE:

- **During tank leak test, Engine Control Module (ECM) limits "test function active" to approx. 12 minutes.**
- **If the accelerator pedal is depressed during the test, the test will be**

aborted.

- **To repeat the tank leak test, switch ignition off and start engine again and let run at idle for at least 15 minutes.**

If specified value is obtained:

- End diagnosis and switch ignition off.

If specified value is not obtained:

- EVAP canister system, checking for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak Detection Pump (LDP) -V144-, checking. See **CHECK LEAK DETECTION PUMP (LDP)** .

Diagnostic mode 9: Vehicle information

Function

In this diagnostic mode, vehicle specific diagnostic data such as e.g. the control module versions will be displayed.

Requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Switch ignition on.
- Under address word 33, select "Diagnostic mode 9: vehicle information".
- Select desired vehicle information "Test-ID XX".

DISPLAY VEHICLE INFORMATION

Test- ID	Diagnostic text
04:	Calibration identification, example: • 06A906032MC4622 Engine Control Module (ECM) identification
06:	CVN (control module-check sum), example: • E80034 the check sum is different for every control module version • No results

- End diagnosis and switch ignition off.

READINESS CODE

Function

The readiness code is an 8 digit number block that indicates the status of emission relevant diagnostics.

When the diagnostic for a system (e.g.: secondary air system) has run through successfully, the respective digit of the number block is set from 1 to 0.

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an emissions relevant system, the readiness code should be generated via a road test to ensure that these systems are working according to specifications. If a malfunction is recognized during diagnostic, it is stored in DTC memory.

The readiness code is erased every time DTC memory is erased or when voltage supply is interrupted. DTC memory should therefore only be erased when there are DTCs stored.

Read readiness code

Requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80° C **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- select desired measuring value "PID 01".
- Observe the right 8-digit number block:

If all diagnoses have run through successfully, the 8-digit number block Specified value: "00000000" must be displayed.

Evaluation PID 01: System status-information (right 8-digit number block:)

EVALUATION PID 01: SYSTEM STATUS-INFORMATION

Meaning if display position = 0								
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Diagnostic function**
0								Exhaust gas recirculation OK

								• not available/always "0"
	0							Oxygen sensor heater OK
		0						Oxygen sensors OK
			0					A/C system OK • not available/always "0"
				0				Secondary Air Injection (AIR) system OK
					0			EVAP canister system (tank ventilation system) OK
						0		Catalytic converter heater OK • not available/always "0"
							0	Catalytic converter OK

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Generate readiness code. See **READINESS CODE, GENERATING** .

Readiness code, generating

Requirements

- The respective fuses of the Motronic fuel injection and ignition system must be OK:

NOTE: Fuse holder is located behind access panel at far left end of dash.

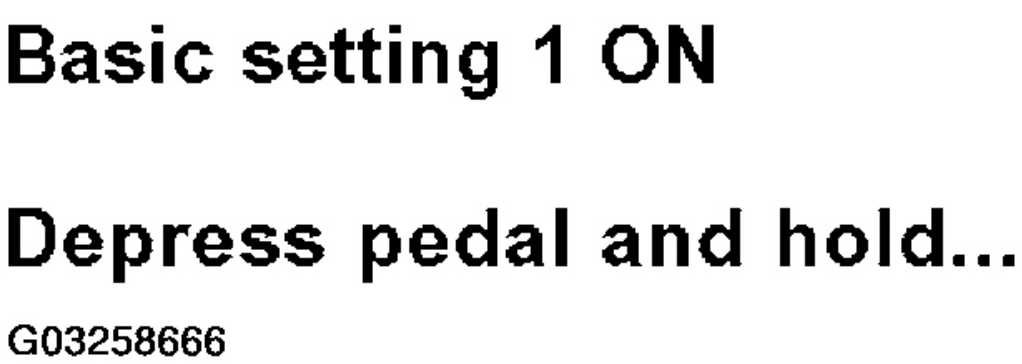

Fig. 14: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.

- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- There must not be any DTCs stored in DTC memory. See **Diagnostic mode 3: Check DTC Memory** .
- Intake air temperature 5 to 35° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test.

The following operating condition must be met during this road test:

- Coolant temperature must reach at least 80 °C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Observe the safety precautions that apply to road tests. See **SAFETY PRECAUTIONS** .

Let vehicle cool off with the ignition switched off until the following condition is met:

- Coolant temperature approx. intake air temperature (5 to 35° C). See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).

- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.

NOTE:

- **Vehicle speed. See DIAGNOSTIC MODE 1: CHECK MEASURED VALUES .**
- **Engine speed. See DIAGNOSTIC MODE 1: CHECK MEASURED VALUES .**

- After 10 minutes, downshift until an engine speed of 2800 to 3500 RPM has been reached.
- Drive in deceleration mode at a speed up to approx. 1800 RPM.
- Park vehicle and let engine run at idle for 3 minutes.

- Accelerator pedal must not be operated during this time.

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let engine run at idle for 3 minutes.
- Accelerator pedal must not be operated during this time.
- Read readiness code. See **READ READINESS CODE** .

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Read readiness code. See **READ READINESS CODE** .

In 8-digit number block:

- Display position 5: Secondary Air Injection (AIR) system

and/or

- Display position 6: EVAP canister system

a 1 instead of 0 is displayed:

- Repeat complete work procedure. See **WORK PROCEDURE** .

DIAGNOSTIC TROUBLE CODE (DTC) TABLES:

SAE P0xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P0016-P0038

SAE-DTC	DTC text	Corrective action
P0016	Crankshaft Position - Camshaft Position	• Check Engine Speed (RPM) Sensor -G28-. See **CHECK ENGINE SPEED (RPM) SENSOR** .

	Correlation, Bank 1 Sensor A	• Check Camshaft Position (CMP) Sensor -G40-. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
P0030	HO2S Heater Control Circuit, Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P0031	HO2S Heater Control Circuit Low, Bank 1 Sensor 1	
P0032	HO2S Heater Control Circuit High, Bank 1 Sensor 1	
P0036	HO2S Heater Control Circuit, Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .
P0037	HO2S Heater Control Circuit Low, Bank 1 Sensor 2	
P0038	HO2S Heater Control Circuit High, Bank 1 Sensor 2	

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0101-P0113

SAE-DTC	DTC text	Corrective action
P0101	Mass or Volume Air Flow Circuit Range/Performance	• Check Mass Air Flow (MAF) Sensor -G70-. See **MASS AIR FLOW (MAF) SENSOR, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .
P0102	Mass or Volume Air Flow Circuit Low Input	
P0103	Mass or Volume Air Flow Circuit High Input	
P0112	Intake Air Temperature Sensor 1 Circuit Low	• Check Intake Air Temperature (IAT) Sensor -G42-. See **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR** .
P0113	Intake Air Temperature Sensor 1 Circuit High	

DIAGNOSTIC TROUBLE CODE P0116-P0123

SAE-DTC	DTC text	Corrective action
P0116	Engine Coolant Temperature Circuit Range/Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** .
P0117	Engine Coolant Temperature	

	Circuit Low	• Check thermostat: See **COOLING SYSTEM COMPONENTS - ENGINE SIDE, REMOVING AND INSTALLING** .
P0118	Engine Coolant Temperature Circuit High	
P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	

DIAGNOSTIC TROUBLE CODE P0130-P0135

SAE-DTC	DTC text	Corrective action
P0130	O2 Sensor Circuit, Bank 1 Sensor 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P0131	O2 Sensor Circuit Low Voltage, Bank 1 Sensor 1	
P0132	O2 Sensor Circuit High Voltage, Bank 1 Sensor 1	
P0133	O2 Sensor Circuit Slow Response, Bank 1 Sensor 1	
P0134	O2 Sensor Circuit No Activity Detected, Bank 1 Sensor 1	
P0135	O2 Sensor Heater Circuit, Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

DIAGNOSTIC TROUBLE CODE P0136-P0141

SAE-DTC	DTC text	Corrective action
P0136	O2 Sensor Circuit, Bank 1 Sensor 2	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND**
P0137	O2 Sensor Circuit	

	Low Voltage, Bank 1 Sensor 2	**CATALYTIC CONVERTER** .
P0138	O2 Sensor Circuit High Voltage, Bank 1 Sensor 2	
P0139	O2 Sensor Circuit Slow Response, Bank 1 Sensor 2	
P0140	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	
P0141	O2 Sensor Heater Circuit, Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

DIAGNOSTIC TROUBLE CODE P0170

SAE-DTC	DTC text	Corrective action
P0170	Fuel Trim, Bank 1	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P0171

SAE-DTC	DTC text	Corrective action
P0171	System Too Lean, Bank 1	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .

		• Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P0172

SAE-DTC	DTC text	Corrective action
P0172	System Too Rich, Bank 1	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0201-P0223

SAE-DTC	DTC text	Corrective action
P0201	Injector Circuit/Open - Cylinder 1	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** .
P0202	Injector Circuit/Open - Cylinder 2	
P0203	Injector Circuit/Open - Cylinder 3	
P0204	Injector Circuit/Open - Cylinder 4	
P0221	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	

DIAGNOSTIC TROUBLE CODE P0226-P0230

SAE-DTC	DTC text	Corrective action
P0226	Throttle/Pedal Position Sensor/Switch "C" Circuit Range/Performance	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P0227	Throttle/Pedal Position Sensor/Switch "C" Circuit Low	
P0228	Throttle/Pedal Position Sensor/Switch "C" Circuit High	
P0230	Fuel Pump Primary Circuit	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram: See appropriate System Wiring Diagram article.

DIAGNOSTIC TROUBLE CODE P0261-P0271

SAE-DTC	DTC text	Corrective action
P0261	Cylinder 1 Injector Circuit Low	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-). See **FUEL INJECTORS, CHECKING** .
P0262	Cylinder 1 Injector Circuit High	
P0264	Cylinder 2 Injector Circuit Low	
P0265	Cylinder 2 Injector Circuit High	
P0267	Cylinder 3 Injector Circuit Low	
P0268	Cylinder 3 Injector Circuit High	
P0270	Cylinder 4 Injector Circuit Low	
P0271	Cylinder 4 Injector Circuit High	

Ignition system

DIAGNOSTIC TROUBLE CODE P0300-P0304

SAE-DTC	DTC text	Corrective action
P0300	Random/Multiple Cylinder Misfire Detected	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check spark plugs. See **TEST DATA, SPARK PLUGS** .

P0301	Cylinder 1 Misfire Detected	Vehicles with engine code AEG: • Check Ignition Coil -N152-. See **CHECKING IGNITION COIL (VEHICLES WITH ENGINE CODE AEG)** . Vehicles with engine code AVH, AZG, BDC: • Check ignition coils with power output stages (-N70-, -N127-, -N291-, - N292-). See **CHECKING IGNITION COILS WITH POWER OUTPUT STAGES (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** . • Check intake system for leaks. See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .
P0302	Cylinder 2 Misfire Detected	
P0303	Cylinder 3 Misfire Detected	
P0304	Cylinder 4 Misfire Detected	

DIAGNOSTIC TROUBLE CODE P0321 - P0324

SAE-DTC	DTC text	Corrective action
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	• Check Engine Speed (RPM) Sensor -G28-. See **CHECK ENGINE SPEED (RPM) SENSOR** .
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	
P0324	Knock Control System Error	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-). See **CHECK KNOCK SENSORS** . • Loosen knock sensors and tighten to 20 Nm again • Repair abnormal engine noise (components loose, bracket/bolts broken) • Change fuel types

DIAGNOSTIC TROUBLE CODE P0327-P0333

SAE-DTC	DTC text	Corrective action
P0327	Knock Sensor 1 Circuit Low, Bank 1 or Single Sensor	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-). See **CHECK KNOCK SENSORS** . • Loosen knock sensors and tighten to 20 Nm again
P0328	Knock Sensor 1 Circuit High, Bank 1 or Single Sensor	
P0332	Knock Sensor 2 Circuit Low, Bank 2	
P0333	Knock Sensor 2 Circuit High, Bank 2	

DIAGNOSTIC TROUBLE CODE P0340-P0343

SAE-DTC	DTC text	Corrective action
P0340	Camshaft Position Sensor "A" Circuit, Bank 1 or Single Sensor	• Check Camshaft Position (CMP) Sensor -G40-. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
P0341	Camshaft Position Sensor "A" Circuit Range/Performance, Bank 1 or Single Sensor	
P0342	Camshaft Position Sensor "A" Circuit Low, Bank 1 or Single Sensor	
P0343	Camshaft Position Sensor "A" Circuit High, Bank 1 or Single Sensor	

DIAGNOSTIC TROUBLE CODE P0351-P0354

SAE-DTC	DTC text	Corrective action
P0351	Ignition Coil "A" Primary/Secondary Circuit	Vehicles with engine code AEG: • Check Ignition Coil -N152-. See **CHECKING IGNITION COIL (VEHICLES WITH ENGINE CODE AEG)** . Vehicles with engine code AVH, AZG, BDC • Check ignition coils with power output stages (-N70-, -N127-, -N291-, -N292-). See **CHECKING IGNITION COILS WITH POWER OUTPUT STAGES (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P0352	Ignition Coil "B" Primary/Secondary Circuit	
P0353	Ignition Coil "C" Primary/Secondary Circuit	
P0354	Ignition Coil "D" Primary/Secondary Circuit	

Additional emissions regulation

DIAGNOSTIC TROUBLE CODE P0411

SAE-DTC	DTC text	Corrective action
P0411	Secondary Air Injection System Incorrect Flow Detected	• Check Secondary Air Injection (AIR) Pump Motor -V101-. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** . • Check hoses and connecting pipes to and between components. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check combination valve. See **COMBINATION VALVE, CHECKING** . Vehicles with engine code AEG:

		• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .

DIAGNOSTIC TROUBLE CODE P0412-P0422

SAE-DTC	DTC text	Corrective action
P0412	Secondary Air Injection System Switching Valve "A" Circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	
P0418	Secondary Air Injection System Control "A" Circuit	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-
P0420	Catalyst System Efficiency Below Threshold, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P0422	Main Catalyst Efficiency Below Threshold, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check catalytic converter. See **CATALYTIC CONVERTER, CHECKING** .

DIAGNOSTIC TROUBLE CODE P0440-P0456

SAE-DTC	DTC text	Corrective action
P0440	Evaporative Emission System	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** . • EVAP canister system, check for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
P0441	Evaporative Emission System Incorrect Purge Flow	
P0442	Evaporative Emission System Leak Detected (small leak)	

P0444	Evaporative Emission System Purge Control Valve Circuit Open	
P0445	Evaporative Emission System Purge Control Valve Circuit Shorted	
P0455	Evaporative Emission System Leak Detected (large leak)	
P0456	Evaporative Emission System Leak Detected (very small leak)	

Speed and idle control

DIAGNOSTIC TROUBLE CODE P0501-P0510

SAE-DTC	DTC text	Corrective action
P0501	Vehicle Speed Sensor "A" Range/Performance	• Check speed signal. See **SPEED SIGNAL, CHECKING** .
P0506	Idle Air Control System RPM Lower Than Expected	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P0507	Idle Air Control System RPM Higher Than Expected	
P0510	Closed Throttle Position Switch	

Control module and output signals

DIAGNOSTIC TROUBLE CODE P0600-P0606

SAE-DTC	DTC text	Corrective action
P0600	Serial Communication Link	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P0601	Internal Control Module Memory Check Sum Error	• Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .
P0602	Control Module Programming Error	
P0604	Internal Control Module Random Access Memory (RAM) Error	
P0605	Internal Control Module Read Only Memory (ROM)	

	Error	
P0606	ECM/PCM Processor	

DIAGNOSTIC TROUBLE CODE P0638 - P0687

SAE-DTC	DTC text	Corrective action
P0638	Throttle Actuator Control Range/Performance, Bank 1	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** . • Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P0650	Malfunction Indicator Lamp (MIL) Control Circuit	• Check emissions Malfunction Indicator Lamp (MIL) -K83-. See **MALFUNCTION INDICATOR LAMP (MIL) IN INSTRUMENT CLUSTER, CHECKING** .
P0685	ECM/PCM Power Relay Control Circuit /Open	• Check voltage supply of Motronic Engine Control Module (ECM) -J220-. See **VOLTAGE SUPPLY FOR ENGINE CONTROL MODULE (ECM)** . • Check Activation of Motronic Engine Control Module (ECM) Power Supply Relay -J271- according to wiring diagram: See appropriate System Wiring Diagram article.
P0686	ECM/PCM Power Relay Control Circuit Low	
P0687	ECM/PCM Power Relay Control Circuit High	

transmission

DIAGNOSTIC TROUBLE CODE P0704

SAE-DTC	DTC text	Corrective action
P0704	Clutch Switch Input Circuit Malfunction	• Check signal from Clutch Vacuum Vent Valve Switch -F36-. See **CHECKING SIGNAL FROM CLUTCH VACUUM VENT VALVE SWITCH** .

SAE P1xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1102-P1118

SAE-DTC	DTC text	Corrective action
P1102	Bank 1-sensor 1, heating circuit short to B+	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC**

P1103	Bank 1 -sensor 1, heating circuit, output too low	**CONVERTER (TWC), CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P1105	Bank 1 -sensor 2, heating circuit short to B+	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1115	Bank 1 -sensor 1, heating circuit short to Ground	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1116	Bank 1 -sensor 1, heating circuit open	
P1117	Bank 1 -sensor 2, heating circuit short to Ground	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1118	Bank 1 -sensor 2, heating circuit open	

DIAGNOSTIC TROUBLE CODE P1127

SAE-DTC	DTC text	Corrective action
P1127	Bank 1, mixture adaptation (mult.) System too rich	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .

DIAGNOSTIC TROUBLE CODE P1128

SAE-DTC	DTC text	Corrective action
P1128	Bank 1, mixture adaptation (mult.) System too lean	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** .

		• Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1136

SAE-DTC	DTC text	Corrective action
P1136	Bank 1, mixture adaptation (add.) system too lean	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

NOTE: add = additive, means that malfunction is only valid at closed throttle (idle).

DIAGNOSTIC TROUBLE CODE P1137

SAE-DTC	DTC text	Corrective action
P1137	Bank 1, mixture adaptation (add.) system too rich	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .

NOTE: add = additive, means that malfunction is only valid at closed throttle (idle).

DIAGNOSTIC TROUBLE CODE P1141-P1143

SAE-DTC	DTC text	Corrective action
P1141	Load detection implausible value	• Check Mass Air Flow (MAF) Sensor -G70-. See **MASS AIR FLOW (MAF) SENSOR, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** . • Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P1142	Load detection, lower limit not reached	
P1143	Load detection limit exceeded	

DIAGNOSTIC TROUBLE CODE P1151

SAE-DTC	DTC text	Corrective action
P1151	Bank 1, Long Term Fuel Trim, Range 1, Leanness Lower Limit Exceeded	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1152

SAE-DTC	DTC text	Corrective action
P1152	Bank 1, Long Term Fuel Trim, Range 2, Leanness Lower Limit Exceeded	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP**

		(FP) . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1165-P1173

SAE-DTC	DTC text	Corrective action
P1165	Bank 1, mixture adaptation, area 1, richness limit exceeded	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
P1166	Bank 1, mixture adaptation, area 2, richness limit exceeded	
P1171	Throttle Actuation Potentiometer Sign.2, Range/Performance	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P1172	Throttle Actuation Potentiometer Sign.2, Signal too low	
P1173	Throttle Actuation Potentiometer Sign.2, Signal too high	

DIAGNOSTIC TROUBLE CODE P1176

SAE-DTC	DTC text	Corrective action
P1176	Bank 1 oxygen sensor correction behind cat. control limit reached	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check intake air system for leaks (false air). See **INTAKE**

		SYSTEM FOR LEAKS (FALSE AIR), CHECKING .

DIAGNOSTIC TROUBLE CODE P1178-P1186

SAE-DTC	DTC text	Corrective action
P1178	linear Lambda probe / pump current, open	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P1179	linear Lambda probe / pump current, short to ground	
P1180	linear Lambda probe / pump current, short to B+	
P1181	linear Lambda probe / reference voltage, open	
P1182	linear Lambda probe / reference voltage, short to ground	
P1183	linear Lambda probe / reference voltage, short to B+	
P1184	linear Lambda probe / common ground wire, open	
P1185	linear Lambda probe / common ground wire, short to ground	
P1186	linear Lambda probe / common ground wire, short to B+	

DIAGNOSTIC TROUBLE CODE P1196-P1198

SAE-DTC	DTC text	Corrective action
P1196	Bank 1 -sensor 1, heating circuit electrical malfunction	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1198	Bank 1 -sensor 2,	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three

	heating circuit electrical malfunction	Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1213-P1228

SAE-DTC	DTC text	Corrective action
P1213	Cyl.1-Fuel Injector Circ., Short to B+	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** .
P1214	Cyl.2-Fuel Injector Circ., Short to B+	
P1215	Cyl.3-Fuel Injector Circ., Short to B+	
P1216	Cyl.4-Fuel Injector Circ., Short to B+	
P1225	Cyl.1-Fuel Injector Circ., Short to Ground	
P1226	Cyl.2-Fuel Injector Circ., Short to Ground	
P1227	Cyl.3-Fuel Injector Circ., Short to Ground	
P1228	Cyl.4-Fuel Injector Circ., Short to Ground	

DIAGNOSTIC TROUBLE CODE P1237-P1240

SAE-DTC	DTC text	Corrective action
P1237	Cyl.1-Fuel Injector Circ. Open	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-). See **FUEL INJECTORS, CHECKING** .
P1238	Cyl.2-Fuel Injector Circ. Open	
P1239	Cyl.3-Fuel Injector Circ. Open	
P1240	Cyl.4-Fuel Injector Circ. Open	

DIAGNOSTIC TROUBLE CODE P1255 - P1296

SAE-		

DTC	DTC text	Corrective action
P1255	Engine Coolant Temp. Sensor Circ. Short to Ground	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check thermostat: See **COOLING SYSTEM COMPONENTS -ENGINE SIDE, REMOVING AND INSTALLING** .
P1256	Engine Coolant Temp. Sensor Circ. Open/Short to B+	
P1296	Malfunction in cooling system	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check thermostat: See **COOLING SYSTEM COMPONENTS -ENGINE SIDE, REMOVING AND INSTALLING** .

Ignition system

DIAGNOSTIC TROUBLE CODE P1300

SAE-DTC	DTC text	Corrective action
P1300	Misfire detected, Reason: Fuel level too low	• Fuel level less than 2 gallons, add fuel to tank • Check signal from sender for fuel gauge -G-. • Check wire connection between Engine Control Module (ECM) and instrument cluster according to wiring diagram: See appropriate System Wiring Diagram article.

DIAGNOSTIC TROUBLE CODE P1335 - P1340

SAE-DTC	DTC text	Corrective action
P1335	Engine torque monitoring 2 control limit exceeded	• Check Mass Air Flow (MAF) Sensor -G70-. See **MASS AIR FLOW (MAF) SENSOR, CHECKING** .
P1336	Engine torque monitoring control limit exceeded	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check Intake Air Temperature (IAT) Sensor -G42-. See **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR** .
P1340	Camshaft/Crankshaft Position Sensor Signals Out of Sequence	• Check Camshaft Position (CMP) Sensor -G40-. See **CHECK CAMSHAFT POSITION (CMP)**

		SENSOR . • Check Engine Speed (RPM) Sensor -G28-. See **CHECK ENGINE SPEED (RPM) SENSOR** .

Additional emissions regulation

DIAGNOSTIC TROUBLE CODE P1410-P1426

SAE-DTC	DTC text	Corrective action
P1410	Tank Ventilation Valve Circ., Short to B+	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
P1420	Secondary Air Injection (AIR) solenoid valve - N112- electrical malfunction in circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .
P1421	Secondary Air Injection (AIR) solenoid valve - N112- short circuit to Ground (GND)	
P1422	Secondary Air Injection (AIR) solenoid valve - N112- short circuit to B+	
P1424	Bank 1, Secondary Air Injection (AIR) system, leak detected	• Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** .
P1425	Tank Vent. Valve, Short to Ground	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
P1426	EVAP canister purge regulator valve -N80- open circuit	

DIAGNOSTIC TROUBLE CODE P1432-P1435

SAE-DTC	DTC text	Corrective action
P1432	Secondary Air Injection (AIR) solenoid valve - N112- open circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .
P1433	Secondary Air Injection (AIR) pump relay -J299- open circuit	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.
P1434	Secondary Air Injection	

	(AIR) pump relay -J299- short circuit to B+	
P1435	Secondary Air Injection (AIR) pump relay -J299- short circuit to Ground (GND)	

DIAGNOSTIC TROUBLE CODE P1450-P1452

SAE-DTC	DTC text	Corrective action
P1450	Secondary Air Injection System Circ., Short to B+	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.
P1451	Secondary Air Injection System Circ., Short to Ground	
P1452	Secondary Air Injection System, Open Circ.	

DIAGNOSTIC TROUBLE CODE P1471-P1476

SAE-DTC	DTC text	Corrective action
P1471	EVAP Emission Contr. LDP Circ., Short to B+	• Check Leak Detection Pump (LDP) -V144-. See **CHECK LEAK DETECTION PUMP (LDP)** . • EVAP canister system, check for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
P1472	EVAP Emission Contr. LDP Circ., Short to Ground	
P1473	Leak Detection Pump (LDP) tank ventilation system open circuit	
P1475	Leak Detection Pump (LDP) for tank ventilation system, malfunction / no signal	
P1476	Leak Detection Pump (LDP) tank ventilation system malfunction/vacuum too low	

DIAGNOSTIC TROUBLE CODE P1500-P1541

SAE-DTC	DTC text	Corrective action
P1500	Fuel Pump (FP) Relay -J17- electrical malfunction in circuit	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram: See appropriate System Wiring Diagram article.
P1501	Fuel Pump Relay Circ., Short to Ground	
P1502	Fuel Pump Relay Circ., Short to B+	
P1541	Fuel Pump (FP) Relay -J17- open circuit	

DIAGNOSTIC TROUBLE CODE P1542-P1580

SAE-DTC	DTC text	Corrective action
P1542	Angle sensor -1- for throttle drive (power accelerator actuation) -G187-, implausible signal	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P1543	Angle sensor -1- for throttle drive (power accelerator actuation) -G187-, signal too small	
P1544	Angle sensor -1- for throttle drive (power accelerator actuation) -G187-, signal too large	
P1545	Throttle valve regulation, malfunction	
P1558	Throttle Actuator, Electrical Malfunction	
P1559	Throttle Valve Control Module -J338-, malfunction in basic setting	
P1565	Throttle Valve Control Module -J338- lower limit not attained	
P1580	Throttle Actuator B1 Malfunction	

DIAGNOSTIC TROUBLE CODE P1582

SAE-DTC	DTC text	Corrective action
P1582	Idle Adaption at Limit	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

Control module and output signals

DIAGNOSTIC TROUBLE CODE P1626 - P1634

SAE-DTC	DTC text	Corrective action
P1626	Data-Bus Powertrain, Missing Message from TCM.	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P1630	Throttle Position (TP) sensor -G79- signal too small	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P1631	Throttle Position (TP) Sensor -G79- signal too large	
P1633	Sender -2- for accelerator pedal position -G185- signal too small	
P1634	Sender -2- for accelerator pedal position -G185- signal too large	

DIAGNOSTIC TROUBLE CODE P1635-P1681

SAE-DTC	DTC text	Corrective action
P1635	Data -Bus Powertrain, missing message from air condition control	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P1639	Throttle Position (TP) sensor -G79- and sender -2- for accelerator pedal position -G185-, implausible signal	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P1640	Control module faulty	• Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .
P1648	Data Bus Powertrain, defect	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P1649	Powertrain CAN-bus missing message from ABS control module	
P1650	Data Bus Powertrain, missing message from instrument panel ECM	
P1681	Contr. Unit Programming, Programming not Finished	• Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

DIAGNOSTIC TROUBLE CODE P1691-P1693

SAE-DTC	DTC text	Corrective action
P1691	Malfunction Indicator Lamp, Open	• Check emissions Malfunction Indicator Lamp (MIL) -K83-. See **MALFUNCTION INDICATOR LAMP (MIL) IN INSTRUMENT CLUSTER, CHECKING** .
P1692	Malfunction Indicator Lamp, Short to Ground	
P1693	Malfunction Indicator Lamp, Short to B+	

SAE P2xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P2096-P2097

SAE-DTC	DTC text	Corrective action
P2096	Post Catalyst Fuel Trim System Too Lean, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P2101-P2138

SAE-DTC	DTC text	Corrective action
P2101	Throttle Actuator Control Motor Circuit Range/Performance	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P2106	Throttle Actuator Control System - Forced Limited Power	
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low	

	Input
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input
P2133	Throttle/Pedal Position Sensor/Switch "F" Circuit High Input
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation

DIAGNOSTIC TROUBLE CODE P2177-P2181

SAE-DTC	DTC text	Corrective action
P2177	System Too Lean Off Idle, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .
P2178	System Too Rich Off Idle, Bank 1	
P2181	Cooling System Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check thermostat: See **COOLING SYSTEM COMPONENTS -ENGINE SIDE, REMOVING AND INSTALLING** .

DIAGNOSTIC TROUBLE CODE P2187-P2192

SAE-DTC	DTC text	Corrective action
P2187	System Too Lean at Idle, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .
P2188	System Too Rich at Idle, Bank 1	
P2191	System Too Lean at Higher Load, Bank 1	

P2192	System Too Rich at Higher Load, Bank 1	• Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P2243-P2251

SAE-DTC	DTC text	Corrective action
P2243	O2 Sensor Reference Voltage Circuit/Open, Bank 1 Sensor 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P2251	O2 Sensor Negative Current Control Circuit/Open, Bank 1 Sensor 1	

Additional emissions regulation

DIAGNOSTIC TROUBLE CODE P2400-P2404

SAE-DTC	DTC text	Corrective action
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	• Check Leak Detection Pump (LDP) -V144-. See **CHECK LEAK DETECTION PUMP (LDP)** . • EVAP canister system, check for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	

SAE P3xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P3211

SAE-DTC	DTC text	Corrective action
P3211	Exhaust-bank 1 sensor 1 Heater return connection	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY**